PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:
CHRISTOPHER A. BODE, ET AL

Serial No.: 09/824,301

Filed: APRIL 2, 2001

For: METHOD AND APPARATUS FOR INITIALIZING PROCESS CONTROLLERS BASED ON TOOL EVENT DATA

Examiner: S. Schectman

Group Art Unit: 2125

Att'y Docket: 2000.057800

APPEAL BRIEF

CERTIFICATE OF MAILING
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MS APPEAL BRIEF - PATENTS
Commissioner of Patents
P. O. Box 1450
Alexandria, VA 22313-1450

Sir:

Appellants hereby submit this Appeal Brief to the Board of Patent Appeals and Interferences in response to the final Office Action dated February 15, 2005. A Notice of Appeal was filed April 4, 2005 and so this Appeal Brief is believed to be timely filed.

The Assistant Commissioner is authorized to deduct the fee for filing this Appeal Brief ($500) from **Advanced Micro Devices, Inc. Deposit Account No. 01-0365/TT4119**. In the event the monies in the account are insufficient the Assistant Commissioner is authorized to withdraw funds from Williams, Morgan & Amerson, P.C. Deposit No. 50-0786/2000.057800.

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I. REAL PARTY IN INTEREST

The present application is owned by Advanced Micro Devices, Inc. The assignment of the present application to Advanced Micro Devices, Inc., is recorded at Reel 11707, Frame 0843.

II. RELATED APPEALS AND INTERFERENCES

Appellants are not aware of any related appeals and/or interferences that might affect the outcome of this proceeding.

III. STATUS OF THE CLAIMS

Claims 1-45 are pending in the application. Claims 8-10, 16, 19-21, 27, 38-40, and 45 have been allowed.

Claims 1-2, 4, 6, 11-13, 17, 22-24, 28, 30-31, 34, and 41-42 stand rejected under 35 U.S.C. § 102(e) as allegedly being anticipated by Runnels (U.S. Patent No. 6,169,931). Claims 1-2, 4, 6-7, 11, 13, 17-18, 22, 24, 28-31, 34, and 42 stand rejected under 35 U.S.C. § 102(e) as allegedly being anticipated by Mendez (U.S. Patent Publication No. 2001/0039462). Claims 35-37 stand rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Mendez in view of Jevtic (U.S. Patent Publication No. 2002/0147960). Claims 3, 5, and 32-33 stand rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Mendez in view of Vickers (U.S. Patent No. 5,659,467). Claims 14-15, 25-26, and 43-44 stand rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Mendez in view of Klimasauskas (U.S. Patent No. 6,110,214).

IV. STATUS OF AMENDMENTS

There were no amendments after the final rejections.

V. SUMMARY OF CLAIMED SUBJECT MATTER

Claims 1, 17, and 28 set forth, among other things, a method for initializing process controllers based on tool event data. The method includes providing a tool having a process controller adapted to employ a control model to control an operating recipe of the tool, receiving a tool event notification, and initializing the control model in response to receiving the tool event notification.

In one exemplary embodiment of the present invention, one or more tools 30 may include process controllers 80 that are adapted to automatically control the operating recipes of their respective tools 30. The process controller 80 may use a performance model of the tool 30 to generate its prediction. The process controllers 80 may be notified of tool events that have the potential for affecting the operating characteristics of their associated tools 30. In response to receiving a tool event notification, the process controller 80 may take a variety of actions to limit the likelihood of defective product processing. The specific actions may vary depending on the nature of the tool event and the control abilities of the process controller 80. Collectively, the actions taken in response to the tool event notification are referred to as initializing the process controller 80 based on the new operating characteristics of the tool 30. See Patent Application, page 8, line 17 - page 10, line 2 and Figure 1.

In the present case, Appellants have defined the term tool events to mean periodic preventative maintenance procedures or calibrations to keep the tool in optimum or acceptable operating condition. For example, polishing tools include polishing pads that are periodically

conditioned or replaced. Etch tools and deposition tools are periodically cleaned using *in situ* cleans or complete disassembly cleans. Steppers are periodically calibrated to maintain alignment accuracy and exposure dose consistency. See Patent Application, page 4, ll. 10-18. Appellants note that an inventor is entitled to be his or her own lexicographer. See, *e.g.*, MPEP §2111.01. Thus, Appellants believe that this definition of the term "tool event" should be adopted when interpreting the claims.

Dependent claims 35-37 also set forth the step of scheduling a qualification procedure on a tool. For example, in response to receiving the tool event notification, the process controller 80 may communicate with the process control server 50 or a tool operator to force the processing of one or more test wafers in the tool 30 to determine a new blanket wafer removal rate. The qualification process may be reduced in scope compared to a full scale tool qualification procedure. Using the new blanket wafer removal rate, the process controller 80 may initialize its control model for subsequent processing runs. See Patent Application, page 10, ll. 10-15.

Dependent claims 3, 5, 14-15, 25-26, 32-33, and 43-44 also set forth etching or deposition tools, which may include a chamber. In one exemplary embodiment, the process controller 80 may be capable of estimating the effect of the new operating characteristics of the tool 30 on its control algorithm performance. For example, historical data may allow the process controller 80 to generate an approximate value for a control variable used in its performance model. For example, the effect on etch rate or deposition rate following an *in situ* cleaning of the chamber operation may be predictable. The process controller 80 then uses an approximate processing rate to initialize its control model for subsequent processing runs. See Patent Application, page 10, ll. 16-22.

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

Appellant respectfully requests that the Board review and overturn the five rejections present in this case. The following issues are presented on appeal in this case:

(A) Whether claims 1-2, 4, 6, 11-13, 17, 22-24, 28, 30-31, 34, and 41-42 are anticipated by Runnels;

(B) Whether claims 1-2, 4, 6-7, 11, 13, 17-18, 22, 24, 28-31, 34, and 42 are anticipated by Mendez;

(C) Whether claims 35-37 are obvious over Mendez in view of Jevtic;

(D) Whether claims 3, 5, and 32-33 are obvious over Mendez in view of Vickers; and

(E) Whether claims 14-15, 25-26, and 43-44 are obvious over Mendez in view of Klimasauskas.

VII. ARGUMENT

A. Legal Standards

An anticipating reference by definition must disclose every limitation of the rejected claim in the same relationship to one another as set forth in the claim. *In re Bond*, 15 U.S.P.Q.2d 1566, 1567 (Fed. Cir. 1990).

To establish a *prima facie* case of obviousness, three basic criteria must be met. First, the prior art reference (or references when combined) must teach or suggest all the claim limitations. *In re Royka*, 490 F.2d 981, 180 U.S.P.Q. 580 (CCPA 1974). Second, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. That is, there must be something in the prior art as a whole to suggest the desirability,

and thus the obviousness, of making the combination. *Panduit Corp. v. Dennison Mfg. Co.*, 810 F.2d 1561 (Fed. Cir. 1986). In fact, the absence of a suggestion to combine is dispositive in an obviousness determination. *Gambro Lundia AB v. Baxter Healthcare Corp.*, 110 F.3d 1573 (Fed. Cir. 1997). The mere fact that the prior art can be combined or modified does not make the resultant combination obvious unless the prior art also suggests the desirability of the combination. *In re Mills*, 916 F.2d 680, 16 U.S.P.Q.2d 1430 (Fed. Cir. 1990); M.P.E.P. § 2143.01. Third, there must be a reasonable expectation of success.

The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure. *In re Vaeck*, 947 F.2d 488, 20 U.S.P.Q.2d 1438 (Fed. Cir. 1991); M.P.E.P. § 2142. A recent Federal Circuit case emphasizes that, in an obviousness situation, the prior art must disclose each and every element of the claimed invention, and that any motivation to combine or modify the prior art must be based upon a suggestion in the prior art. *In re Lee*, 61 U.S.P.Q.2d 143 (Fed. Cir. 2002). Conclusory statements regarding common knowledge and common sense are insufficient to support a finding of obviousness. *Id.* at 1434-35. Moreover, it is the claimed invention, as a whole, that must be considered for purposes of determining obviousness. A mere selection of various bits and pieces of the claimed invention from various sources of prior art does not render a claimed invention obvious, unless there is a suggestion or motivation in the prior art for the claimed invention, when considered as a whole.

B. Claims 1-2, 4, 6, 11-13, 17, 22-24, 28, 30-31, 34, and 41-42 are not anticipated by Runnels.

Runnels is concerned with modeling wear of a chemical mechanical polishing pad. Runnels, however, is completely silent with regard to tool events. In the Final Office Action, the Examiner alleges that the failure of the solution described by Runnels to converge (at box 908 in Figure 9 of Runnels) constitutes a tool event notification. Appellants respectfully disagree and submit that the failure of an iterative algorithm that attempts to determine a tool recipe to converge on a solution is not a tool event, as defined in the specification and claims. In the specification, Appellants have defined the term tool event to mean a periodic preventative maintenance procedure or calibration to keep the tool in optimum or acceptable operating condition. See Patent Application, page 4, ll. 10-17. Thus, Appellants submit that Runnels does not teach or suggest receiving a tool event notification. Appellants also submit that Runnels does not teach or suggest initializing a control model of a processing tool in response to receiving the tool event notification.

For at least the aforementioned reasons, Appellants respectfully submit that the present invention is not anticipated by Runnels and request that the Examiner's rejections of claims 1-2, 4, 6, 11-13, 17, 22-24, 28, 30-31, 34, and 41-42 under 35 U.S.C. 102(e) be REVERSED.

C. Claims 1-2, 4, 6-7, 11, 13, 17-18, 22, 24, 28-31, 34, and 42 are not anticipated by Mendez.

Mendez is directed to software models used in chemical mechanical polishing. Mendez describes activating a feed-back control loop based upon input of post-chemical-mechanical-

polishing data. See Mendez, paragraph [0052]. The control loop updates a run-to-run parameter and tool drift parameter. The Examiner alleges that the input of post-chemical-mechanical-polishing data is a tool event. Appellants respectfully disagree. As discussed above and as defined in the specification, tool events are periodic preventative maintenance procedures or calibrations to keep the tool in optimum or acceptable operating condition. See Patent Application, page 4, ll. 10-17. Appellants respectfully submit that inputting data into a database is not a tool event. Thus, Appellants submit that Mendez does not teach or suggest receiving a tool event notification, as that term is defined in the specification. Appellants also submit that Mendez does not teach or suggest initializing a control model of a processing tool in response to receiving the tool event notification.

For at least the aforementioned reasons, Appellants respectfully submit that the present invention is not anticipated by Mendez and request that the Examiner's rejections of claims 1-2, 4, 6-7, 11, 13, 17-18, 22, 24, 28-31, 34, and 42 under 35 U.S.C. § 102(e) be REVERSED.

D. Claims 35-37 are not obvious over Mendez in view of Jevtic.

As discussed above, Mendez fails to teach or suggest receiving a tool event notification. Mendez also fails to teach or suggest initializing a control model of a processing tool in response to receiving the tool event notification. Furthermore, Mendez is directed to modeling chemical mechanical polishing using a feed-back loop to update tool drift parameter and appears to be unconcerned with tool events. See Mendez, paragraph [0052]. In particular, Mendez is completely silent with regard to the potential for a tool event to affect operating characteristics of an associated tools or taking any action to limit the likelihood of defective product processing that may be caused by the tool event. Thus, Mendez provides no suggestion or motivation to

modify the prior art to arrive at Appellants' claimed invention. The Examiner relies on Jevtic to describe scheduling periodic removal of a wafer for testing. However, Jevtic fails to remedy the aforementioned deficiencies of the primary reference.

For at least the aforementioned reasons, Appellants respectfully submit that the Examiner has failed to make a *prima facie* case that the present invention is obvious over Mendez in view of Jevtic. Appellants respectfully request that the Examiner's rejections of claims 35-37 under 35 U.S.C. 103(a) be REVERSED.

E. Claims 3, 5, and 32-33 are not obvious over Mendez in view of Vickers.

As discussed above, Mendez fails to teach or suggest receiving a tool event notification. Mendez also fails to teach or suggest initializing a control model of a processing tool in response to receiving the tool event notification. Furthermore, as set forth above, Mendez is directed to modeling chemical mechanical polishing using a feed-back loop to update tool drift parameter and appears to be unconcerned with tool events. See Mendez, paragraph [0052]. In particular, Mendez is completely silent with regard to the potential for a tool event to affect operating characteristics of an associated tools or taking any action to limit the likelihood of defective product processing that may be caused by the tool event, as this term is defined in the specification. Thus, Mendez provides no suggestion or motivation to modify the prior art to arrive at Appellants' claimed invention. The Examiner relies on Vickers to describe use of an etch tool or a deposition tool. However, Vickers fails to remedy the aforementioned deficiencies of the primary reference.

For at least the aforementioned reasons, Appellants respectfully submit that the Examiner has failed to make a *prima facie* case that the present invention is obvious over Mendez in view

of Vickers. Appellants respectfully request that the Examiner's rejections of claims 3, 5, and 32-33 under 35 U.S.C. 103(a) be REVERSED.

F. Claims 14-15, 25-26, and 43-44 are not obvious over Mendez in view of Klimasauskas.

As discussed above, Mendez fails to teach or suggest receiving a tool event notification. Mendez also fails to teach or suggest initializing a control model of a processing tool in response to receiving the tool event notification, at least in part because Mendez is completely silent with regard to the potential for a tool event to affect operating characteristics of an associated tools or taking any action to limit the likelihood of defective product processing that may be caused by the tool event. Thus, Mendez provides no suggestion or motivation to modify the prior art to arrive at Appellants' claimed invention. The Examiner relies on Klimasauskas to describe providing a notification that a tool chamber has been cleaned. However, Klimasauskas fails to remedy the aforementioned deficiencies of the primary reference.

For at least the aforementioned reasons, Appellants respectfully submit that the Examiner has failed to make a *prima facie* case that the present invention is obvious over Mendez in view of Klimasauskas. Appellants respectfully request that the Examiner's rejections of claims 14-15, 25-26, and 43-44 under 35 U.S.C. 103(a) be REVERSED.

VIII. CLAIMS APPENDIX

The claims that are the subject of the present appeal – claims 1-7, 11-15, 17-18, 22-26, 28-37, and 41-44 – are set forth in the attached "Claims Appendix."

IX. EVIDENCE APPENDIX

There is no separate Evidence Appendix for this appeal.

X. RELATED PROCEEDINGS APPENDIX

There is no Related Proceedings Appendix for this appeal.

XI. CONCLUSION

In view of the foregoing, it is respectfully submitted that the Examiner erred in not allowing all claims pending in the present application, claims 1-45, over the prior art of record. The undersigned may be contacted at (713) 934-4052 with respect to any questions, comments or suggestions relating to this appeal.

Respectfully submitted,

Date: 5/17/05

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AGENT FOR APPELLANTS

CLAIMS APPENDIX

1. (Original) A method for initializing process controllers based on tool event data, comprising:

providing a tool having a process controller adapted to employ a control model to control an operating recipe of the tool;

receiving a tool event notification; and

initializing the control model in response to receiving the tool event notification.

2. (Original) The method of claim 1, wherein initializing the control model comprises:

estimating a control variable value; and

initializing the control model based on the estimated control variable value.

3. (Original) The method of claim 2, wherein the tool comprises an etch tool adapted to etch features on a semiconductor wafer, and estimating the control variable value includes estimating an etch rate.

4. (Original) The method of claim 2, wherein the tool comprises a polishing tool adapted to planarize a semiconductor wafer, and estimating the control variable value includes estimating a material removal rate.

5. (Original) The method of claim 2, wherein the tool comprises a deposition tool adapted to form a layer on a semiconductor wafer, and estimating the control variable value includes estimating a deposition rate.

6. (Original) The method of claim 1, further comprising:

performing a qualification procedure on the tool in response to receiving the tool event notification to determine a control variable value; and

initializing the control model based on the control variable value.

7. (Original) The method of claim 6, wherein the tool comprises a polishing tool adapted to planarize a semiconductor wafer, and performing the qualification procedure comprises processing a test wafer in the polishing tool to determine a blanket wafer removal rate.

8. (Previously Presented) A method for initializing process controllers based on tool event data, comprising:

providing a tool having a process controller adapted to employ a control model to control an operating recipe of the tool;

receiving a tool event notification;

initializing the control model in response to receiving the tool event notification, initializing the control model comprising:

performing a qualification procedure on the tool in response to receiving the tool event notification to determine a control variable value, wherein the tool comprises a photolithography stepper adapted to expose a photoresist layer on a semiconductor wafer, and performing the qualification procedure comprises processing a test wafer in the photolithography

stepper to determine an overlay characteristic of the photolithography stepper; and

initializing the control model based on the control variable value.

9. (Previously Presented) A method for initializing process controllers based on tool event data, comprising:

providing a tool having a process controller adapted to employ a control model to control an operating recipe of the tool;

receiving a tool event notification;

initializing the control model in response to receiving the tool event notification, initializing the control model comprising:

performing a qualification procedure on the tool in response to receiving the tool event notification to determine a control variable value, wherein the tool comprises a deposition tool adapted to form a layer on a semiconductor wafer, and performing the qualification procedure comprises depositing the process layer on a test wafer in the deposition tool to determine a deposition rate; and

initializing the control model based on the control variable value.

10. (Previously Presented) A method for initializing process controllers based on tool event data, comprising:

providing a tool having a process controller adapted to employ a control model to control an operating recipe of the tool;

receiving a tool event notification;

initializing the control model in response to receiving the tool event notification, initializing the control model comprising:

performing a qualification procedure on the tool in response to receiving the tool event notification to determine a control variable value, wherein the tool comprises an etch tool adapted to etch features on a semiconductor wafer, and performing the qualification procedure comprises etching a test wafer in the etch tool to determine an etch rate; and

initializing the control model based on the control variable value.

11. (Original) The method of claim 1, wherein receiving the tool event notification comprises receiving a notification of at least one of a tool calibration and a tool preventative maintenance activity.

12. (Original) The method of claim 1, wherein the tool comprises a polishing tool having at least one polishing pad adapted to planarize a semiconductor wafer, and receiving the tool event notification comprises receiving a notification when the polishing pad is replaced.

13. (Original) The method of claim 1, wherein the tool comprises a polishing tool having at least one polishing pad adapted to planarize a semiconductor wafer, and receiving the tool event notification comprises receiving a notification when the polishing pad is conditioned.

14. (Original) The method of claim 1, wherein the tool comprises an etch tool having a chamber, and receiving the tool event notification comprises receiving a notification when the chamber is cleaned.

15. (Original) The method of claim 1, wherein the tool comprises a deposition tool having a chamber, and receiving the tool event notification comprises receiving a notification when the chamber is cleaned.

16. (Previously Presented) A method for initializing process controllers based on tool event data, comprising:

providing a tool having a process controller adapted to employ a control model to control an operating recipe of the tool;

receiving a tool event notification; and

initializing the control model in response to receiving the tool event notification, wherein the tool comprises a photolithography stepper adapted to expose a photoresist layer on a semiconductor wafer, and receiving the tool event notification comprises receiving a notification when a red-blue calibration is performed on the photolithography stepper.

17. (Original) A method for initializing process controllers based on tool event data, comprising:

providing a tool having a process controller adapted to employ a control model to control an operating recipe of the tool;

receiving a tool event notification;

performing a qualification procedure on the tool in response to receiving the tool event notification to determine a control variable; and

initializing the control model based on the control variable.

18. (Original) The method of claim 17, wherein the tool comprises a polishing tool adapted to planarize a semiconductor wafer, and performing the qualification procedure comprises processing a test wafer in the polishing tool to determine a blanket wafer removal rate.

19. (Previously Presented) A method for initializing process controllers based on tool event data, comprising:

providing a tool having a process controller adapted to employ a control model to control an operating recipe of the tool;

receiving a tool event notification;

performing a qualification procedure on the tool in response to receiving the tool event notification to determine a control variable, wherein the tool comprises a photolithography stepper adapted to expose a photoresist layer on a semiconductor wafer, and performing the qualification procedure comprises processing a test wafer in the photolithography stepper to determine an overlay characteristic of the photolithography stepper; and

initializing the control model based on the control variable.

20. (Previously Presented) A method for initializing process controllers based on tool event data, comprising:

providing a tool having a process controller adapted to employ a control model to control an operating recipe of the tool;

receiving a tool event notification;

performing a qualification procedure on the tool in response to receiving the tool event notification to determine a control variable, wherein the tool comprises a deposition tool adapted to form a layer on a semiconductor wafer, and performing the qualification procedure comprises depositing the process layer on a test wafer in the deposition tool to determine a deposition rate; and

initializing the control model based on the control variable.

21. (Previously Presented) A method for initializing process controllers based on tool event data, comprising:

providing a tool having a process controller adapted to employ a control model to control an operating recipe of the tool;

receiving a tool event notification;

performing a qualification procedure on the tool in response to receiving the tool event notification to determine a control variable, wherein the tool comprises an etch tool adapted to etch features on a semiconductor wafer, and performing the qualification procedure comprises etching a test wafer in the etch tool to determine an etch rate; and

initializing the control model based on the control variable.

22. (Original) The method of claim 17, wherein receiving the tool event notification comprises receiving a notification of at least one of a tool calibration and a tool preventative maintenance activity.

23. (Original) The method of claim 17, wherein the tool comprises a polishing tool having at least one polishing pad adapted to planarize a semiconductor wafer, and receiving the tool event notification comprises receiving a notification when the polishing pad is replaced.

24. (Original) The method of claim 17, wherein the tool comprises a polishing tool having at least one polishing pad adapted to planarize a semiconductor wafer, and receiving the tool event notification comprises receiving a notification when the polishing pad is conditioned.

25. (Original) The method of claim 17, wherein the tool comprises an etch tool having a chamber, and receiving the tool event notification comprises receiving a notification when the chamber is cleaned.

26. (Original) The method of claim 17, wherein the tool comprises a deposition tool having a chamber, and receiving the tool event notification comprises receiving a notification when the chamber is cleaned.

27. (Previously Presented) A method for initializing process controllers based on tool event data, comprising:

providing a tool having a process controller adapted to employ a control model to control an operating recipe of the tool;

receiving a tool event notification, wherein the tool comprises a photolithography stepper adapted to expose a photoresist layer on a semiconductor wafer, and receiving the tool event notification comprises receiving a notification when a red-blue calibration is performed on the photolithography stepper;

performing a qualification procedure on the tool in response to receiving the tool event notification to determine a control variable; and

initializing the control model based on the control variable.

28. (Original) A manufacturing system, comprising:

a tool adapted to process wafers in accordance with an operating recipe; and

a process controller adapted to control the operating recipe in accordance with a control model, wherein the process controller is further adapted to receive a tool event notification and initialize the control model in response to receiving the tool event notification.

29. (Original) The manufacturing system of claim 28, further comprising a process control server adapted to send the tool event notification to the process controller.

30. (Original) The manufacturing system of claim 28, wherein the tool event notification comprises a notification of at least one of a tool calibration and a tool preventative maintenance activity.

31. (Original) The manufacturing system of claim 28, wherein the process controller is adapted to estimate a control variable value and initialize the control model based on the estimated control variable value.

32. (Original) The manufacturing system of claim 31, wherein the tool comprises an etch tool adapted to etch features on a semiconductor wafer, and the estimated control variable value comprises an etch rate.

33. (Original) The manufacturing system of claim 31, wherein the tool comprises a deposition tool adapted to form a layer on a semiconductor wafer, and the estimated control variable value comprises a deposition rate.

34. (Original) The manufacturing system of claim 31, wherein the tool comprises a polishing tool adapted to planarize a semiconductor wafer, and the estimated control variable value comprises a material removal rate.

35. (Original) The manufacturing system of claim 29, wherein the process controller is adapted to contact the process control server to schedule a qualification procedure on the tool in response to receiving the tool event notification.

36. (Original) The manufacturing system of claim 35, wherein the tool is adapted to perform the qualification procedure, and the process controller is configured to determine a control variable value based on the qualification procedure.

37. (Original) The manufacturing system of claim 36, wherein the tool comprises a polishing tool adapted to planarize a semiconductor wafer, the qualification procedure comprises processing a test wafer in the polishing tool, and the process controller is configured to determine a blanket wafer removal rate as the control variable value.

38. (Previously Presented) A manufacturing system, comprising:

a tool adapted to process wafers in accordance with an operating recipe;

a process controller adapted to control the operating recipe in accordance with a control model, wherein the process controller is further adapted to receive a tool event notification and initialize the control model in response to receiving the tool event notification; and

a process control server adapted to send the tool event notification to the process controller, wherein the process controller is adapted to contact the process control server to schedule a qualification procedure on the tool in response to receiving the tool event notification, and wherein the tool is adapted to perform the qualification procedure, and the process controller is configured to determine a control variable value based on the qualification procedure, and wherein the tool comprises a photolithography stepper adapted to expose a photoresist layer on a semiconductor wafer, the qualification procedure comprises processing a test wafer in the

photolithography stepper, and the process controller is configured to determine an overlay characteristic of the photolithography stepper.

39. (Previously Presented) A manufacturing system, comprising:

a tool adapted to process wafers in accordance with an operating recipe;

a process controller adapted to control the operating recipe in accordance with a control model, wherein the process controller is further adapted to receive a tool event notification and initialize the control model in response to receiving the tool event notification; and

a process control server adapted to send the tool event notification to the process controller, wherein the process controller is adapted to contact the process control server to schedule a qualification procedure on the tool in response to receiving the tool event notification, and wherein the tool is adapted to perform the qualification procedure, and the process controller is configured to determine a control variable value based on the qualification procedure, and wherein the tool comprises an etch tool adapted to etch features on a semiconductor wafer, the qualification procedure comprises etching a test wafer in the polishing tool, and the process controller is configured to determine an etch rate as the control variable value.

40. (Previously Presented) A manufacturing system, comprising:

a tool adapted to process wafers in accordance with an operating recipe;

a process controller adapted to control the operating recipe in accordance with a control model, wherein the process controller is further adapted to receive a tool event notification and initialize the control model in response to receiving the tool event notification; and

a process control server adapted to send the tool event notification to the process controller, wherein the process controller is adapted to contact the process control server to schedule a qualification procedure on the tool in response to receiving the tool event notification, and wherein the tool is adapted to perform the qualification procedure, and the process controller is configured to determine a control variable value based on the qualification procedure, and wherein the tool comprises a deposition tool adapted to form a process layer on a semiconductor wafer, the qualification procedure comprises forming the process layer on a test wafer in the deposition tool, and the process controller is configured to determine a deposition rate as the control variable value.

41. (Original) The manufacturing system of claim 28, wherein the tool comprises a polishing tool having at least one polishing pad adapted to planarize a semiconductor wafer, and the tool event notification comprises a notification that the polishing pad has been replaced.

42. (Original) The manufacturing system of claim 28, wherein the tool comprises a polishing tool having at least one polishing pad adapted to planarize a semiconductor wafer, and the tool event notification comprises a notification that the polishing pad has been conditioned.

43. (Original) The manufacturing system of claim 28, wherein the tool comprises an etch tool having a chamber, and the tool event notification comprises a notification that the chamber has been cleaned.

44. (Original) The manufacturing system of claim 28, wherein the tool comprises a deposition tool having a chamber, and the tool event notification comprises a notification that the chamber has been cleaned.

45. (Previously Presented) A manufacturing system, comprising:

a tool adapted to process wafers in accordance with an operating recipe; and

a process controller adapted to control the operating recipe in accordance with a control model, wherein the process controller is further adapted to receive a tool event notification and initialize the control model in response to receiving the tool event notification, wherein the tool comprises a photolithography stepper adapted to expose a photoresist layer on a semiconductor wafer, and the tool event notification comprises a notification that a red-blue calibration has been performed on the photolithography stepper.